In the Name of Allah, the Most Beneficent, the Most Merciful.

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Assignment no : 1

Course Code: Assignment No.1 (Course STA 301)

Submitted to: **Dr. Saleha Naghmi**

Question.1

A quality control manager at a poultry farm is monitoring the weight of eggs produced. The weights of 20 randomly selected eggs (in grams) are as follows:

65, 68, 60, 76, 65, 74, 58, 56, 61, 57, 63, 64, 72, 66, 65, 67, 65, 63, 67, 67.

Find the coefficient of variation.

Solution:

X	X^2
65	422
68	5
60	462
76	4
65	360
74	0
58	577
56	6
61	422
57	5
63	547
64	6
72	336
66	4
65	313
67	6
65	372

63 67 67	1 3249 3969 4096 5184 4356 4225 4489 4225 3969 4489 4489
∑ X= 1299	∑ X^2 = 84887

Standard Derivation = $$\sqrt{\frac{\sum_{i=1}^{n} X_i^2}{n} - \left(\frac{\sum_{i=1}^{n} X_i}{n}\right)^2}$$

$$\text{Standard Derivation} = \sqrt{\frac{84887}{20} - \left(\frac{1299}{20}\right)^2}$$

$$\text{Standard Derivation} = \sqrt{25.8475}$$

$$\text{Standard Derivation} = 5.084$$

Now we find the mean value,

We know that:

$$\textbf{Mean} = \frac{\sum \text{of values}}{\text{number of values}}$$

By using above relation we get

$$\textbf{Mean}\ (\bar{X}) = \textbf{64.95}$$

$$\text{Coefficient of variation} = \frac{\textbf{Standard Derivation}}{(\bar{X})} \times 100$$

$$\text{Coefficient of variation} = \frac{5.084}{(64.95)} \times 100$$

$$\text{Coefficient of variation} = 7.827\%$$

Question 2:

At a large manufacturing company, the following is a record of the working hours that were logged for 32 different personnel. The five-number summary should be used to check the symmetry of the data.

13, 23, 25, 30, 33, 36, 26, 24, 23, 28, 22, 25, 26, 29, 19, 23, 25, 30, 40, 39, 36, 38, 35, 32, 31, 30, 37, 33, 27, 26, 28, 24.

To find the five-number summary, we need to organize the data and identify the following statistics:

1. **Minimum (smallest observation)**
2. **First Quartile (Q1)**
3. **Median (Second Quartile)**
4. **Third Quartile (Q3)**
5. **Maximum (largest observation)**

Solution:

Organize the data in ascending order:

13, 19, 22, 23, 23, 23, 24, 24, 25, 25, 25, 26, 26, 26, 27, 28, 28, 29, 30, 30, 30, 31, 32, 33, 33, 35, 36, 36, 37, 38, 39, 40.

1. Minimum (smallest observation):

Minimum: 13

2.First Quartile (Q1):

NO. Of observation are 32

We know that,

$$\textbf{First Quartile (Q1)} = \left[\frac{n+1}{4}\right]^{th} \textit{items values}$$

$$\textbf{First Quartile (Q1)} = \left[\frac{32+1}{4}\right]^{th} \textit{items values}$$

3. Find the

$$\textbf{First Quartile (Q1)} = \left[\frac{33}{4}\right]^{th} \textit{items values}$$

$$\textbf{First Quartile (Q1)} = 8.25 \textit{ items values}$$

$$\textit{From the quartile formula we can write,}$$

$$Q_1 = 8^{th} \textit{ term} + 0.25\left(9^{th} \textit{ term} - 8^{th} \textit{ term}\right)$$

$$Q_1 = 24 + 0.25(25 - 24)$$

$$Q_1 = 24.25$$

$$\textit{So first quartile is } 24.25$$

Median (Second Quartile):

$$\textbf{Median (Second Quartile)}: \ \textbf{Quartile}\ (\mathbf{Q}_2) = \left[\frac{n+1}{2}\right]^{th} \mathit{items\ values}$$

$$\textbf{Median (Second Quartile)}: (\mathbf{Q}_2) = \left[\frac{32+1}{2}\right]^{th} \mathit{items\ values}$$

$$\textbf{Median (Second Quartile)}: \ (\mathbf{Q}_2) = \left[\frac{33}{2}\right]^{th} \mathit{items\ values}$$

$$\textbf{Median (Second Quartile)}: \ (\mathbf{Q}_2) = 16.5\ \mathit{items\ values}$$

From the quartile formula we can write;

$$Q_2 = 16^{th}\ term + 0.5\left(17^{th}\ term - 16^{th}\ term\right)$$

$$Q_2 = 28 + 0.5(28 - 28)$$

$$Q_2 = 28$$

So, second Quartile is 28

4.

$$Third\ Quartile\ (Q_3) = \left[\frac{3(n+1)}{4}\right]^{th}\ items\ values$$

$$Third\ Quartile\ (Q_3) = \left[\frac{3(32+1)}{4}\right]^{th}\ items\ values$$

$$Third\ Quartile\ (Q_3) = \left[\frac{99}{4}\right]^{th}\ items\ values$$

$$Third\ Quartile\ (Q_3) = 24.75^{th}\ items\ values$$

$$From\ the\ quartile\ formula\ we\ can\ write,$$

$$Q_3 = 24^{th}\ term + 0.75(25^{th}\ term - 24^{th}\ term)$$

$$Q_3 = 33 + 0.75(33 - 33)$$

$$Q_3 = 33$$

5.Maximum (largest observation):

Maximum (largest observation) =40

To check the symmetry of the data, we can compare the quartiles and median.

- If the data is symmetric median will be approximately at the centre of the data, with quartiles equally spaced around it.
- If data is skewed left the median will be closer to Q3 than to Q1.

- If data is skewed right the median will be closer to the Q1 than to Q3.

Comparing to quartile and the median,

$Q1-X_{min}$

=24.5-13

=11.5

Now,

Q2-Q1

= 28-24.5

=3.5

Q3-Q2

=33-28

=5

X_{max} –Q3

=40-33

=7

From the calculation we can observed that $Q1-X_{min}=X_{max}$ – Q3 and Q2-Q1 is not too different from Q3-Q2.This suggest that approximately symmetric though the data seem to be slightly skewed right as the distance between the third quartile and the median is slightly greater than the distance between the median and first quartile .